IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

#16/13
9/9/02

In re application of:

T. KOIKE, ET AL. Group art Unit: 1754

Serial No.: 09/546,227 Examiner: JOHNSON, EDWARD M

Filed: April 10, 2000

For: A CERAMIC SUPPORT CAPABLE OF SUPPORTING A CATALYST, A CATALYST-CERAMIC BODY AND PROCESSES FOR PRODUCING SAME

DECLARATION UNDER 37 C.F.R. § 1.132

Honorable Commissioner of Patents and Trademarks,
Washington, D.C. 20231

Sir:

I, Masakazu Tanaka, a citizen of Japan, residing at Urban-Life Sakae 501, Sakae-cho 4-62, Okazaki City, Aichi Pref. 444-0012, Japan, hereby declare the following.

1. I am a co-inventor of the above-identified patent application.

2. I obtained a masters degree from the Department of Chemical Engineering, Graduate School of Engineering, Kyushu University, where I studied fluid dynamics of mixture and/or agitation. I entered Nippon-Denso (now Denso Corporation) in

1987, and was appointed to the Research & Development Department where I was engaged in the development of an electric control suspension system for automotive use from 1987 to 1990, development of an electrically controlled tire air pressure system for automotive use from 1990 to 1993, and development of an exhaust gas purification system for automotive use from 1993 to 1998. I was then appointed to the Ceramic Engineering Department where I was engaged in the design and development of a ceramic honeycomb substrate for a catalyst converter.

3. As a person skilled in the art of automotive and ceramic honeycomb substrates for catalyst converters, I know that a catalyst is never supported on known ceramic supports when the catalyst is used in practice since the ceramic supports do not have a sufficiently high surface area. A high surface area material such as gamma-alumina is coated on a ceramic support such as a honeycomb structure and a catalyst is supported on the coated high surface area material. Without such a coating, a ceramic support cannot effectively support a sufficient amount of a catalyst directly thereon and such a catalyst-directly-supported ceramic support cannot be used as an affective catalyst or an affective catalyst-ceramic body.

I also know that it is a common practice that in

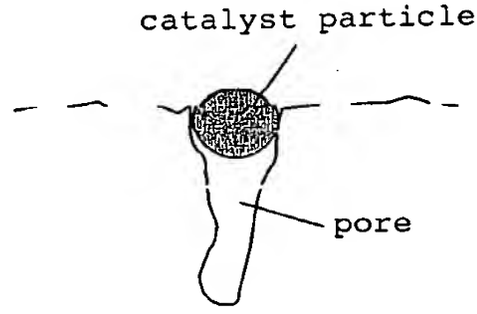
much literature, coating is not mentioned even though a catalyst must have been supported on a ceramic support, and that a person skilled in the art therefore understands that even if the coating was not mentioned in literature, a coating was actually formed on a ceramic support. I can almost surely guarantee the above knowledge as a person who has had been concerned with and worked with the technology of catalyst supporting. At least it is certain that failure to mention a coating does not necessarily mean that a coating was not formed, and even though the coating is not mentioned in Ichii'885, a person skilled in the art would not consider that no coating was formed in Ichii'885.

4. Next, I will show that a ceramic body having fine pores with a size of 0.1 to 100 nm can effectively support a catalyst but a ceramic body having pores with a size of more than 248 cannot effectively support a catalyst.

5. As shown in the following Fig. 1, it can be considered that the size of fine pores of a ceramic body corresponds to the size of a catalyst particle which can be supported by the fine pores. If the size of the catalyst particle is larger than the size of the fine pore, the catalyst particle cannot be fixed or supported by the fine pore. If the size of the catalyst particle is smaller than the size of the fine pore, the catalyst particle enters into

a deep portion of the fine pore and cannot effectively work as a catalyst since the catalyst particle does not contact a material to be catalyzed, for example, an exhaust gas to be purified.

Fig. 1



6. Using a cylindrical catalyst sample comprising activated alumina and catalyst particles and having a diameter of 15 mm and a length of 10 mm and a hydrocarbon sample gas, the temperature (T50) at which 50% of the hydrocarbon sample gas was purified was measured, while the particle size of the catalyst particle was varied. The mean particle size (D) of the catalyst particles was measured by the CO pulse adsorption method. The obtained result is shown as T50v. D in the following Fig. 2.

Fig. 2

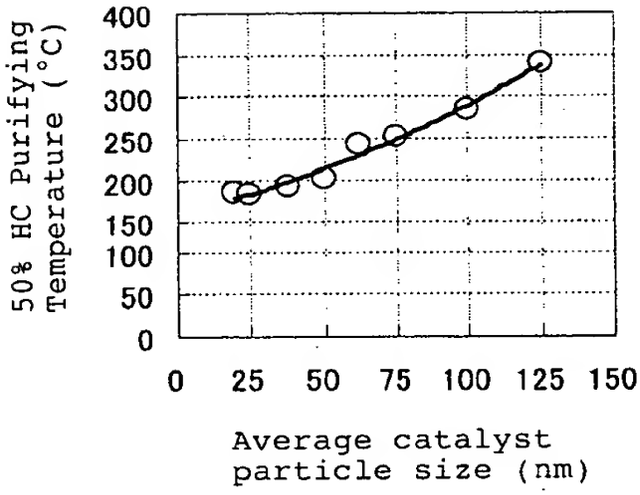
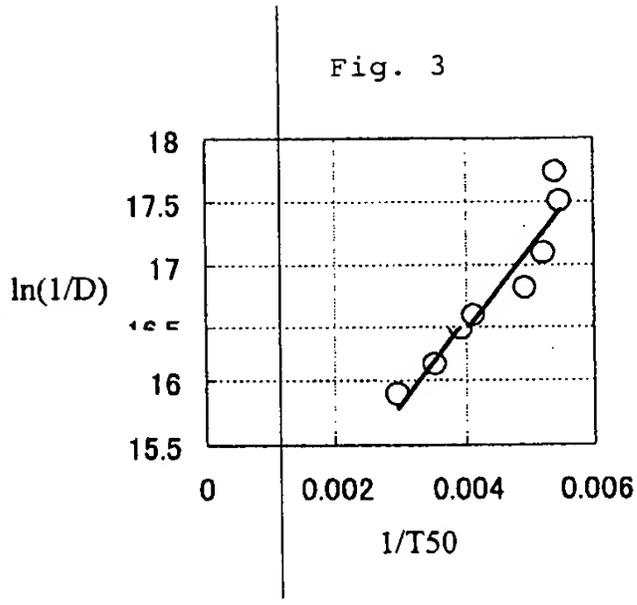


Fig. 3



It is known that T50 and D have the following relationship:

$$\ln(1/D) = A/(T50) + B \qquad (1)$$

Here Fig. 2 is reduced to Fig. 3 which shows the relationship between ln(1/D) and (1/T50). Fig. 3 shows that the formula (1) is satisfied. When the constants A and B in the formula (1) are obtained from Fig. 3, A = 645.45 and B = 13.891. That is, the formula (1) can be expressed as:

$$\ln(1/D) = 645.45/(T50) + 13.891 \qquad (1)$$

When no catalyst was used, T50 was measured to be 489°C.

This value of T50 = 489°C is inserted into the formula (1), the mean catalyst particle diameter (D) becomes 248 nm.

6. Therefore, it can be said that catalyst particles having a mean particle diameter (D) of larger than 248 nm exhibit substantially no catalyst performance.

In contrast, Fig. 3 shows that catalyst particles having a mean particle diameter (D) of 100 nm exhibit a sufficient catalyst performance as T50 is about 300°C.

7. As described above, since the fine pore size can be considered to be the diameter of supportable catalyst particles, fine pores having a mean particle diameter (D) of 100 nm can support catalyst particles having a sufficient catalyst performance, but pores having a mean particle diameter (D) of larger than 489 nm can hardly support catalyst particles having a sufficient catalyst performance.

I, the undersigned declarant, declare further that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and; further, that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001, of Title 18, of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Signed this 9th day of August , 2002

Masakazu Tanaka

Masakazu Tanaka